PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-116756

(43)Date of publication of application : 27.04.2001

(51)Int.Cl. G01N 33/98
C12Q 1/26
C12Q 1/48
C12Q 1/533
C12Q 1/54
G01N 33/48

(21)Application number : 2000-241306

(22)Date of filing : 09.08.2000

(71)Applicant : NIPPON KAYAKU CO LTD

(72)Inventor : MACHIDA REIKO
MASUDA MINORU
TAJIMA SHIGERU

(30)Priority

Priority number : 11225138 Priority date : 09.08.1999 Priority country : JP

(54) LIQUID REAGENT AND PRESERVATION METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To solve a problem caused by the use of a refrigerating drying reagent or the like when glucose should be erased when the quantitative examination of a determination substance in liquid is to be made.

SOLUTION: The present invention is related to a liquid glucose extinction reagent that sets pH to 6-8.5, and is stable for a long time. Furthermore, a liquid reagent for measuring 1,5-anhydroglucitol using the reagent, and a liquid kit for measuring 1,5-anhydroglucitol measurement are provided.

LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application

converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

This Japanese patent was taken from the Japanese Patent Office web site at the following link:
http://www6.ipdl.jpo.go.jp/Tokujitu/PAJdetail.ipdl?N0000=60&N0120=01&N2001=2&N3001=2000-241306

[JP,2000-241306,A]

CLAIMS

[Claim(s)]
[Claim 1] The metal sensor which detects the amount of wear metals of a pump, and the flow rate sensor which detects the flow rate of this pump, A correction detection value calculation means to calculate the correction detection value which seasoned the detection value of one sensor of a threshold setting means to set up the threshold for a pump failure judging, and these metal sensors and these flow rate sensors with the correction value which makes the detection value of the sensor of another side a parameter, The pump fault read-out unit which compares with this threshold from this threshold setting means this correction detection value acquired with this correction detection value calculation means, and is characterized by offering a judgment means to judge whether this pump is failure, and being constituted based on this comparison result.
[Claim 2] The pump fault read-out unit according to claim 1 with which this threshold setting means is characterized by having set up a threshold which permits the aging of the amount of wear metals of this pump, or the flow rate of this pump.
[Claim 3] The pump fault read-out unit according to claim 1 or 2 characterized by to constitute this correction detection value calculation means so that this pump may set up this correction value of the value which may output the judgment result of the purport which is failure, this judgment means may season the detection value of one above-mentioned sensor with this correction value before a machine operator or a machine manager becomes the amount of wear metals or the flow rate which recognizes failure, and this correction detection value may be calculated.
[Claim 4] A pump fault read-out unit given in any 1 term of the claim 1 or the claim 3 characterized by for this correction detection value acquired with this correction detection value calculation means rectifying the detection value from this metal sensor, and computing it based on the detection value from this flow rate sensor.
[Claim 5] The pump fault read-out unit according to claim 1 characterized by being constituted so that this correction detection value calculation means may rectify the detection value from this metal sensor by the correction factor which becomes large as the fall degree of the flow rate of this pump becomes large compared with the fall degree of the flow rate of this pump by the aging and may compute this correction detection

value.
[Claim 6] The pump fault read-out unit according to claim 1 characterized by establishing the pump-control means which can control this pump in the troubleshooting mode status which fixed the pump-output change element at the time of the pump failure judging by this judgment means.
[Claim 7] The pump fault read-out unit according to claim 6 characterized by being constituted so that this pump-control means can control this pump in this troubleshooting mode status by setting a pump ****** control signal, a pump horsepower control signal, an engine-speed control signal, and a pump load-control signal as a predetermined value.
[Claim 8] The pump fault read-out unit according to claim 1 which the regurgitation path and the drain path are connected to this pump, and is characterized by building this flow rate sensor in this pump, arranging it in this regurgitation path, or being arranged in this drain path while this metal sensor is built in this pump or is formed in this drain path.
[Claim 9] The pump fault read-out unit according to claim 1 or 8 with which this flow rate sensor is characterized by being a reaction formula flow rate sensor.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] Especially this invention is used for troubleshooting of the hydraulic pump with which a hydraulic excavator etc. is equipped about a pump fault read-out unit, and relates to a suitable pump fault read-out unit.
[0002]
[Description of the Prior Art] Drawing 8 is a ** type view showing an example of the hydraulic excavator as a general construction equipment, and as shown in this drawing 8 , usually, the hydraulic excavator has offered the revolving super-structure 100 with operation room (cabin) 600 on the base carrier 500 which has infinite rail section 500A, and serves as the configuration of having equipped the joint formula arm device which becomes this revolving super-structure 100 from a boom 200, the stick 300, and the bucket 400 further.
[0003] And while this hydraulic excavator is equipped with the oil hydraulic cylinder 122 for the oil hydraulic cylinder 121 for the oil hydraulic cylinder 120 for a boom 200, and the stick 300, and the bucket 400 The hydraulic circuit for each of these oil hydraulic cylinders 120-122 (illustration abbreviation) is prepared at least. By carrying out electronics control of the flow rate of the hydraulic pump in this hydraulic circuit, or the control valve the oil hydraulic cylinder 120 - for 122 according to operation (operation of the control lever in a cabin 600) of an operator, and changing suitably the amount of supply (oil pressure) of the hydraulic oil to oil hydraulic cylinders 120-122 expansion and contraction of oil hydraulic cylinders 120-122 -- a variation rate -- an amount changes and a boom 200, the stick 300, and the bucket 400 drive, respectively
[0004]
[Problem(s) to be Solved by the Invention] By the way, since such a construction equipment begins a job site, a calamity restoration site, etc. and is usually used in many

cases in the very severe status, it needs to perform the suitable treatment to the abnormalities and failure. Although [most important] especially a hydraulic pump serves as the source of power of such a construction equipment, when the interior of a hydraulic pump is damaged, or a crack arises inside and the hydraulic pump itself breaks down, **** time generates it in ****** of a construction equipment. By foreknowing this pump failure beforehand, to make such **** time into the minimum is desired.

[0005] Then, in such a construction equipment, troubleshooting of a hydraulic pump is performed and various things are proposed as such pump troubleshooting. For example, since failure of a hydraulic pump can be indirectly judged by seeing the flow rate which flows a drain circuit, the technique of performing troubleshooting of a hydraulic pump based on this is indicated by JP,7-280688,A. That is, the flow rate sensor which emits the signal showing the drain flow rate of a pump is prepared, and when either of the rate of change of a drain flow rate or a flow rate exceeds a constant, the technique diagnosed as pump failure is indicated.

[0006] However, since such pump troubleshooting is what diagnoses failure of a hydraulic pump indirectly through a drain flow rate etc., it cannot necessarily perform troubleshooting correctly and certainly. For example, if the interior of a hydraulic pump is damaged, a comparatively big metal chip precipitates in a hydraulic oil or a crack arises inside a hydraulic pump, since a big change will produce a drain circuit to the flowing flow rate, By setup of a threshold [in / though this drain flow rate can perform troubleshooting / pump troubleshooting], when a metal powder is accumulated and the degradation by the aging is usually produced by internal wear in an operating state, it may diagnose as pump failure.

[0007] Moreover, the technique of performing troubleshooting of a pump based on the detection information from the amount detection sensor of metal powders is indicated by JP,6-11376,A. That is, in such pump troubleshooting, as shown in drawing 9 , the metal-powder sensor (a chip detector, metal sensor) 24 is formed in the pump drain line 20 (or pump-case housing), and if the amount of metal powders of the amount set up beforehand is detected by the metal-powder sensor 24, the technique of diagnosing the purport whose pump 12 is failure is indicated. In addition, the sign 11 shows the tank among drawing 9 .

[0008] However, in such pump troubleshooting, by setup of the threshold in pump troubleshooting, when a metal powder is usually accumulated by internal wear in an operating state, it may diagnose as pump failure. Then, if the threshold for avoiding above un-arranging is greatly set as pump troubleshooting, though a pump 12 will break down and the output value of the metal-powder sensor 24 will become large, in order not to immediately exceed a threshold, discovering of pump failure becomes behind.

[0009] For example, as shown in drawing 10 , when the threshold in pump troubleshooting is set up greatly, that pump failure is discovered with the detection value of the metal-powder sensor 24 is t2 by which t3 </SUB> time comes and pump failure is discovered by a machine operator or the machine manager. It will become later than a time. Now, pump failure will be known until an operator or a machine manager notices a construction equipment at the bad condition of a machine, and it is inconvenient.

[0010] In addition, solid-line A shows the output-value property of the metal-powder sensor 24, and the amount property of metal powders of usually generating dashed-line B by internal wear in an operating state, among drawing 10 . And the difference with the amount of metal powders generated by internal wear of usually in an operating state with

the output value of this metal-powder sensor 24 is the amount of metal powders produced when pump failure has arisen, and expresses this as the amount of detrimental metal powders intelligibly. Moreover, the inside of drawing 10 and t1 The crash start time is shown at the time.

[0011] It was originated in view of such a technical probrem, and this invention prevents an incorrect diagnosis of pump failure certainly, and aims at offering the pump fault read-out unit which enabled it to perform pump troubleshooting correctly and certainly.

[0012]

[Means for Solving the Problem] For this reason, the pump fault read-out unit of this invention according to claim 1 The metal sensor which detects the amount of wear metals of a pump, and the flow rate sensor which detects the flow rate of this pump, A correction detection value calculation means to calculate the correction detection value which seasoned the detection value of one sensor of a threshold setting means to set up the threshold for a pump failure judging, and these metal sensors and these flow rate sensors with the correction value which makes the detection value of the sensor of another side a parameter, It is characterized by having compared with this threshold from this threshold setting means this correction detection value acquired with this correction detection value calculation means, offering a judgment means to judge whether this pump is failure, and being constituted based on this comparison result.

[0013] In equipment according to claim 1, as for the pump fault read-out unit of this invention according to claim 2, this threshold setting means is characterized by having set up a threshold which permits the aging of the amount of wear metals of this pump, or the flow rate of this pump. The pump fault read-out unit of this invention according to claim 3 Before becoming the amount of wear metals or flow rate a machine operator or a machine manager recognizes failure to be in equipment according to claim 1 or 2 It is characterized by constituting this correction detection value calculation means so that this pump may set up this correction value of the value which may output the judgment result of the purport which is failure, this judgment means may season the detection value of one above-mentioned sensor with this correction value and this correction detection value may be calculated.

[0014] In equipment given in any 1 term of the claim 1 or the claim 3, as for the pump fault read-out unit of this invention according to claim 4, this correction detection value acquired with this correction detection value calculation means is characterized by rectifying the detection value from this metal sensor, and being computed based on the detection value from this flow rate sensor. It is characterized by constituting the pump fault read-out unit of this invention according to claim 5 so that this correction detection value calculation means may rectify the detection value from this metal sensor by the correction factor which becomes large as the fall degree of the flow rate of this pump becomes large compared with the fall degree of the flow rate of this pump by the aging and may compute this correction detection value in equipment according to claim 4.

[0015] The pump fault read-out unit of this invention according to claim 6 is characterized by establishing the pump-control means which can control this pump in the troubleshooting mode status which fixed the pump-output change element at the time of the pump failure judging by this judgment means in equipment according to claim 1. The pump fault read-out unit of this invention according to claim 7 is characterized by constituting this pump-control means in equipment according to claim 6, so that this

pump can be controlled in this troubleshooting mode status by setting a pump ****** control signal, a pump horsepower control signal, an engine-speed control signal, and a pump load-control signal as a predetermined value.
[0016] It is characterized by connecting the regurgitation path and the drain path to this pump, building this flow rate sensor in this pump, or arranging it in this regurgitation path in equipment according to claim 1, while this metal sensor is built in this pump or is formed in this drain path, or arranging the pump fault read-out unit of this invention according to claim 8 in this drain path.
[0017] The pump fault read-out unit of this invention according to claim 9 is characterized by this flow rate sensor being a reaction formula flow rate sensor in equipment according to claim 1 or 8.
[0018]
[Embodiments of the Invention] Hereafter, a drawing explains the gestalt of operation of this invention. Drawing 2 is drawing showing the hydraulic excavator as such a work machine in the 1 operation gestalt of this invention typically, and as shown in this drawing 2 , such a hydraulic excavator has become right and left to the advance orientation at this operation gestalt with the configuration that the revolving super-structure with the operation room 600 100 (construction-equipment mainframe) was formed free [rotation] in the level surface on the base carrier 500 which has infinite rail section 500A.
[0019] And the boom (boom member) 200 to which an end is connected possible [rotation] is established to this revolving super-structure 100, and the stick (arm member) 300 to which an end is connected possible [rotation] through the joint section is further formed to the boom 200. Furthermore, to a stick 300, an end is connected possible [rotation] through the joint section, a nose of cam excavates the ground, and the bucket (workplace material) 400 which can hold earth and sand is formed in the interior.
[0020] Moreover, as shown in this drawing 2 , the boom oil hydraulic cylinder 120, the stick oil hydraulic cylinder 121, and the bucket oil hydraulic cylinder 122 (hereafter, there is only the boom cylinder 120 or a cylinder 120 about the boom oil hydraulic cylinder 120, there is only a stick cylinder 121 or a cylinder 121 about the stick oil hydraulic cylinder 121, and there is only the bucket hydraulic cylinder 122 or a cylinder 122 about the bucket oil hydraulic cylinder 122) are formed in this hydraulic excavator to the above-mentioned boom 200, the stick 300, and the bucket 400.
[0021] Here, when the distance between edges expands and contracts, it connects possible [rotation of other ends] to a boom 200, namely, a boom cylinder 120 is infixed between a revolving super-structure 100 and the boom 200, and it can rotate a boom 200 to a revolving super-structure 100, while an end is connected possible [rotation] to a revolving super-structure 100.
[0022] Moreover, it connects possible [rotation of other ends] to a stick 300, namely, the stick cylinder 121 is infixed between a boom 200 and the stick 300 while an end is connected possible [rotation] to a boom 200, and when the distance between edges expands and contracts, it can rotate a stick 300 to a boom 200.
[0023] Furthermore, while a bucket hydraulic cylinder 122 is connected possible [rotation of an end] to a stick 300, it connects possible [rotation of other ends] to a bucket 400, namely, is infixed between a stick 300 and the bucket 400, and when the distance between edges expands and contracts, a bucket 400 can be rotated to a stick 300.

In addition, the link mechanism 130 is formed in the point of the bucket oil hydraulic cylinder 122.

[0024] Moreover, although not illustrated, the hydraulic motor which drives infinite rail section 500A on either side, respectively, and the revolution motor which carries out the revolution drive of the revolving super-structure 100 are also formed. And as shown in drawing 1 and the drawing 2 , respectively, at least, the hydraulic circuit 2 for cylinders 120-122 or the above-mentioned revolution motor 123 is formed, and as shown in drawing 1 , the hydraulic oil tank 11, the hydraulic pump 12 driven by engine (diesel power plant) E, the control valve (the method change valve of three, directional control valve) 13, etc. are further infixed in this hydraulic circuit 2 at the above-mentioned hydraulic excavator. In addition, the hydraulic circuit 2 shows only the thing required for an explanation among drawing 1 .

[0025] Here, a hydraulic oil tank 11 ****s a hydraulic oil. A hydraulic pump 12 carries out regurgitation supply of the hydraulic oil in this hydraulic oil tank 11 as a predetermined pressure oil, it is constituted as a piston type variable-capacity pump here, and the control of flow of a hydraulic oil is possible by changing the amount of strokes of the piston (illustration abbreviation) prepared in the pump 12. That is, the end of the above-mentioned piston is constituted so that a cam plate (creep plate:illustration abbreviation) may be contacted, the amount of strokes of a piston is changed by changing the inclination (******) of this cam plate by control-of-flow section 12a, and the flow rate of a pump 12 is changed.

[0026] A control valve 13 is for changing the supply orientation of the hydraulic oil to a cylinder 120, and controlling expansion and contraction of a cylinder 120. moreover, here If it changes to an opposite direction while a hydraulic oil is supplied to a room in one, a hydraulic oil will be extracted from a room among another side and a cylinder 120 will be extended if it changes from a center valve position to ** on the other hand, respectively While a hydraulic oil is supplied to a room among another side, a hydraulic oil is extracted from a room in one, and a cylinder 120 is shrunken.

[0027] Moreover, although not illustrated in drawing 1 , the control valve for changing the supply orientation of the hydraulic oil to a cylinder 121,122, and controlling expansion and contraction of a cylinder 121,122 is also prepared independently, and it operates similarly about these control valves. Moreover, although not illustrated in drawing 1 , the control valve for changing the supply orientation of the hydraulic oil to a revolution motor, and controlling a revolution motor rotation direction is also prepared independently, and a revolution motor rotation direction reverses it according to a change of the orientation of this control valve.

[0028] Although each change control of each of these control valves is performed by the control means 22 of a controller 1 established in the revolving super-structure 100, with this control means 22, based on the operation information acquired when an operator operates the boom / bucket control lever 6 in the operation room 600, and the stick / revolution control lever 8, the change control signal for a control valve is generated, and a change control signal is supplied to each control valve, respectively.

[0029] Here, a control signal sends to the pilot secondary-pressure-of-reducing-valve control section 35 from the pump load-control section 34 of the control means 22. Moreover, the pump drain line (drain path) 20 is connected outside from the drain port (not shown), and the oil in a hydraulic pump 12 carries out a drain to a hydraulic pump

12 to a hydraulic oil tank 11 through this pump drain line 20. In addition, that by which the pump drain line 20 is connected in this way to the exterior of a hydraulic pump 12 is called external-drain type hydraulic pump.

[0030] By the way, in the above-mentioned hydraulic pump 12, internal friction will arise into the movable fraction, and internal wear will arise by this. For this reason, if the interior is worn to some extent out, it is necessary to exchange for a new thing. This exchange stage can be judged by seeing the amount of wear metals which has precipitated inside a hydraulic pump 12. This is because there is an inclination which the amount of wear metals which precipitates inside a hydraulic pump 12 increases, when the interior of a hydraulic pump 12 is worn out.

[0031] On the other hand, the interior of a hydraulic pump 12 other than precipitation of the metal powder by such internal wear may be damaged, a crack may arise inside the case where a comparatively big metal chip mixes into a hydraulic oil, or the hydraulic pump 12, and an internal leak may arise. Then, with this operation gestalt, internal wear of a hydraulic pump 12, an internal leak, etc. are detected, troubleshooting of a hydraulic pump 12 is performed based on these, and that an alarm signal should be outputted, as shown in drawing 1 , the pump fault read-out unit 10 is formed in the above-mentioned hydraulic circuit 2.

[0032] The metal-powder sensor (a metal sensor, chip detector) 24, the flow rate sensor 25, and the controller 1 are offered, and the pump fault read-out unit 10 is constituted, as shown in drawing 1 . Here, as shown in drawing 3 , the metal-powder sensor 24 is formed in the pump drain line 20, detects the amount of wear metals which has precipitated inside a hydraulic pump 12, and detects internal wear of a hydraulic pump 12 with this amount of wear metals. In addition, you may make the metal-powder sensor 24 build in in a housing case.

[0033] Moreover, the detection value of the metal-powder sensor 24 is detected as a value proportional to a voltage, and the detection value from this metal-powder sensor 24 is continuously monitored by the controller mentioned later. A flow rate sensor 25 is a low voltage disadvantage type reaction formula flow rate sensor, as shown in drawing 3 . Such a reaction formula flow rate sensor is used because it may have a bad influence of the grade in which remarkable back pressure arises and the amount of discharge flows from a pump 12 is reduced in the flow rate sensor used from the former like a turbine flow rate sensor.

[0034] The force which inserts resistor 25a into flowing of a hydraulic oil, and is received from flowing of a hydraulic oil is measured using the force of receiving a flow rate sensor 25 from flowing of a hydraulic oil being proportional to the square of the rate of flow, and a pump discharge flow rate (outflow flow rate from a pump) is detected based on this. This flow rate sensor 25 has short rectification length, and is an accurate sensor.

[0035] A flow rate sensor 25 is arranged in the regurgitation path 21 connected to a hydraulic pump 12, and detects the amount of discharge flows of a hydraulic pump 12. In addition, since the flow rate sensor 25 is compact, it can be made to be able to build in a pump 12, or can also be arranged in a pump discharge port (not shown). And in order to take the degradation by the aging into consideration in pump troubleshooting with this operation gestalt, it is pump discharge flow Q S by the flow rate sensor 25 in the troubleshooting mode of a **** [time / of shipment and an overhaul procedure]. Instrumentation carries out. In addition, pump discharge flow Q S which does in this way

and was measured It records on the pump-performance reference-value Records Department 41 which mentions later.
[0036] Moreover, during an operation of a construction equipment, if the information urged to measuring a pump discharge flow rate periodically is displayed on display 26, an operator operates the mode selection equipment 60 according to this and it is set as the troubleshooting mode, it is pump discharge flow Q C by the flow rate sensor 25. It measures. In addition, pump discharge flow Q C which does in this way and was measured It records on the pump-performance Records Department 42 which mentions later.
[0037] In addition, although urged to measuring a pump discharge flow rate periodically, whenever a metal powder is detected by the metal-powder sensor 24, you may be made to urge to measuring a pump discharge flow rate here. A controller 1 is constituted in the control means (pump-control means) 22 and the failure judging means 23, in order to perform pump troubleshooting, as shown in drawing 1 .
[0038] Among these, the control means 22 has the troubleshooting mode setting section 30 which sets the control signal to a pump 12 as the troubleshooting mode always kept constant. In addition, the mode selection equipment 60 is formed in this construction equipment, and the troubleshooting mode can be chosen when the mode selection equipment 60 performs pump troubleshooting. Here, the troubleshooting mode is the mode in which the control signal to a pump 12 is set as the thing for troubleshooting, and these pump ******s, pump horsepower, an engine speed, and a pump load control it in this troubleshooting mode to the predetermined value set up beforehand that pump ******, the pump horsepower, the engine speed, and pump load as a pump-output change element should be fixed. Since a pump is controlled by the conditions always same by this when performing pump troubleshooting, pump troubleshooting can be performed correctly.
[0039] For this reason, when the troubleshooting mode setting section 30 is set as the troubleshooting mode through the mode selection equipment 60, as shown in drawing 1 , a pump ****** control signal, a pump horsepower control signal, an engine-speed control signal, and a pump load-control signal set it as a predetermined value, respectively by the pump ****** control section 31, the pump horsepower control section 32, the engine-speed control section 33, and the pump load-control section 34.
[0040] Here, the pump load-control section 34 sets the spool of a control valve 13 as a center valve position, or controls drawing of center bypass path 13a of a control valve 13 to become the pressure detected by the pressure sensor (not shown) prepared in the pump discharge port, i.e., the constant value with a pump discharge pressure. When it judges with judging whether the interior of a hydraulic pump 12 damages the failure judging means 23, a crack arises inside a hydraulic pump 12, an internal leak arises [a comparatively big metal chip mixes into a hydraulic oil, or], and the hydraulic pump is out of order based on the detection result of the metal-powder sensor 24, and it being out of order ********, an alarm signal is outputted to display (display means) 26.
[0041] For this reason, the failure judging means 23 is equipped with a threshold setting means, a correction detection value calculation means, and a judgment means, and is constituted. Here, a threshold setting means sets up a threshold (threshold for a pump failure judging) as a value which permits the aging of the amount of wear metals inside a pump 12.

[0042] A correction detection value calculation means calculates a correction detection value by rectifying the detection value of the metal-powder sensor 24 based on the correction value which makes a parameter the detection value of a flow rate sensor 25. With this correction detection value calculation means, before a machine operator or a machine manager becomes the amount of predetermined wear metals which recognizes failure, a judgment means sets up the correction value of the value which may output the judgment result of the purport whose pump 12 is failure, and calculates a correction detection value by rectifying the detection value of the metal-powder sensor 24 using this correction value. In addition, it is intelligibly expressed as the amount of wear metals which regards as the amount of predetermined wear metals from the degradation of a pump 12, and may discover pump failure by the machine operator or the machine manager.

[0043] Here, a correction detection value rectifies the detection value from the metal-powder sensor 24 by the correction factor which becomes large, and computes it as the fall degree of the detection value from a flow rate sensor 25 becomes large compared with the fall degree of the pump discharge flow rate by the aging. A judgment means compares with the threshold from a threshold setting means the correction detection value acquired with the correction detection value calculation means, and when it judges with the pump 12 judging and being out of order in whether it is failure based on a comparison result, it outputs an alarm signal to display (display means) 26 as a judgment result of the purport whose pump 12 is failure.

[0044] Specifically, the failure judging means 23 is equipped with the pump-performance reference-value Records Department 41, the pump-performance Records Department 42, the counter 43, the degradation flow rate operation part 44, the gain operation part 45, the amount operation part 46 of detrimental metal powders, and the fault-detect decision section 47, and is constituted. Among these, the pump-performance reference-value Records Department 41 is pump discharge flow Q S measured by the flow rate sensor 25 at the time of shipment and an overhaul procedure. It records. In addition, pump discharge flow Q S It outputs to the degradation flow rate operation part 44.

[0045] The pump-performance Records Department 42 is pump discharge flow rate (namely, detection value from flow rate sensor 25) QC periodically detected by the flow rate sensor 25 during the operation of a machine. It records. In addition, pump discharge flow Q C It outputs to the degradation flow rate operation part 44. A counter 43 counts the elapsed time from the time of shipment and an overhaul procedure, and counted value t outputs it to the degradation flow rate operation part 44 or the amount operation part 46 of detrimental metal powders.

[0046] The degradation flow rate operation part 44 is pump discharge flow Q S measured at the time of the shipment inputted from the pump-performance reference-value Records Department 41, and an overhaul procedure. It is based and a pump discharge flow rate is beforehand set up in consideration of the flow rate fall by the aging. Moreover, the detection value from a flow rate sensor 25 from the pump-performance Records Department 42 is inputted. and the pump discharge flow rate in counted value t corresponding to the time of the time of shipment and an overhaul procedure to the time of pump troubleshooting set up beforehand and pump discharge flow Q C as a detection value from the flow rate sensor 25 in counted value t a difference -- degradation flow Q d ****** -- it computes In addition, degradation flow Q d computed by the degradation

flow rate operation part 44 It outputs to the gain operation part 45.
[0047] For example, dashed-line B comes to show the pump discharge flow rate with consideration to the flow rate fall by the aging among drawing 4 . On the other hand, solid-line A comes to show the property of the detection value detected by the flow rate sensor 25 when a pump 12 breaks down among drawing 4 . and counted value t2 The pump discharge flow rate which can be set and which was set up beforehand, and counted value t2 Pump discharge flow Q C as a detection value from the flow rate sensor 25 which can be set a difference -- degradation flow Q d ****** -- it is computed in addition, the inside of drawing 4 and the counted value t1 the crash start time of a pump -- counted value t2 Degradation flow Q d **** -- it is a time of it being thought that it sees and pump failure may be discovered by the machine operator or the machine manager
[0048] Thus, when it is degradation with time even if a pump discharge flow rate falls if the fall degree of the pump discharge flow rate by the aging is taken into consideration, it ceases to diagnose as pump failure, and pump troubleshooting can be performed now correctly and certainly. The gain operation part 45 sets up gain G according to the fall degree of the pump discharge flow rate by the aging. That is, degradation flow Q d inputted from the degradation flow rate operation part 44 in the gain operation part 45 by the map which is shown in drawing 5 It is based and gain G is computed. In addition, on the map shown in drawing 5 , gain G is set up as logarithmic scale.
[0049] In addition, gain G computed by the gain operation part 45 is outputted to the fault-detect decision section 47. The amount operation part 46 of detrimental metal powders sets up beforehand the amount (since this metal powder is not what is produced by pump failure, it is a harmless metal powder) of metal powders in consideration of the increase in the amount of metal powders usually generated by wear. Moreover, the detection value of the metal-powder sensor 24 is inputted. And it is amount calcium of detrimental metal powders about the difference of the amount of metal powders in counted value t corresponding to the time of the time of shipment and an overhaul procedure to the time of pump troubleshooting set up beforehand, and amount C of metal powders as a detection value from the metal-powder sensor 24 in counted value t. It carries out and computes. In addition, amount calcium of detrimental metal powders It outputs to the fault-detect decision section 47.
[0050] For example, dashed-line B comes to show the property of the amount of metal powders of having taken into consideration the increase in the amount of metal powders usually generated by wear, among drawing 6 . On the other hand, solid-line A comes to show the property of the detection value detected by the metal-powder sensor 24 when a pump 12 breaks down among drawing 6 . and counted value t2 The amount of metal powders which can be set and which was set up beforehand, and counted value t2 the difference with amount C of metal powders as a detection value from the metal-powder sensor 24 which can be set -- amount calcium of detrimental metal powders ****** -- it is computed in addition, the inside of drawing 6 and the counted value t1 the crash start time of a pump -- counted value t2 Degradation flow Q d **** -- it is a time of it being thought that it sees and pump failure may be discovered by the machine operator or the machine manager
[0051] The fault-detect decision section 47 is amount calcium of detrimental metal powders from the amount operation part 46 of detrimental metal powders, as solid-line A shows among drawing 7 . The multiplication of the gain G computed by the gain

operation part 45 is carried out, and a correction detection value is computed, and when this correction detection value exceeds a threshold, it judges with pump failure. And the fault-detect decision section 47 outputs an alarm signal to display 26 that an operator should be told about it, when it judges with the pump 12 being out of order.

[0052] That is, an above-mentioned correction detection value calculation means is constituted by the degradation flow rate operation part 44, the gain operation part 45, and the amount operation part 46 of detrimental metal powders, and an above-mentioned threshold setting means and a judgment means are constituted by the fault-detect decision section 47. By this, in display 26, a display of the purport that the pump 12 broke down is made, and an operator can recognize certainly that the hydraulic pump 12 broke down. Here, a display of the purport in display 26 that it broke down can consider various modes, such as displaying on the display screen, making a lamp turn on, blinking a lamp, or sounding a buzzer.

[0053] the failure discovery time in the conventional pump failure judging which comes to show the property of the detection value of the metal-powder sensor 24 by dashed-line B among drawing 7 , and uses the detection value of this metal-powder sensor 24 for a pump failure judging as it is here -- counter value t4 it is -- counter value t2 which it is at the failure discovery time by the machine operator or the machine manager It was behind. On the other hand, since a correction detection value property which is shown by solid-line A among drawing 7 is used in a pump failure judging according to the pump failure judging of this operation gestalt, it is counted value t3 at the pump failure discovery time. Counter value t2 which it is at the failure according [become and] to machine operator or machine manager discovery time It becomes early.

[0054] moreover, the inside of drawing 7 and the counted value t1 the crash start time of a pump -- counted value t2 Degradation flow Q d **** -- it sees and the time of it being thought that pump failure may be discovered by the machine operator or the machine manager is shown Thus, when it is usually the increase in the amount of metal powders by wear even if the amount of metal powders increases if the increase in the amount of metal powders by wear is usually taken into consideration, it will not be judged as pump failure.

[0055] Moreover, the detection value of the metal-powder sensor 24 is rectified based on the detection value of a flow rate sensor 25, and troubleshooting of a pump is performed for the ability to perform [even if the metal powder generated by wear of not pump failure but the interior of a pump and other components is accumulated unless a flow rate fall is seen, as it is not judged as failure] troubleshooting of a pump certainly. [usually in an operating state]

[0056] Moreover, when performing pump troubleshooting as mentioned above, in order to avoid the false report by the harmless metal powder by rectifying the detection value of the metal-powder sensor 24, the threshold of the amount of metal powders can be set up highly. In addition, the failure judging means 23 is equipped with the pump design-basis value Records Department 51 or the shipment performance decision section 52, and it can judge now whether the performance of a pump 12 suits a design-basis value at the time of shipment and an overhaul procedure. And decision by the shipment performance decision section 52 is displayed with display 26.

[0057] Since such a pump fault read-out unit is constituted as mentioned above by this operation gestalt, pump troubleshooting is carried out to it as follows. First, when this

pump fault read-out unit performs a pump failure judging, when an operator operates the mode selection equipment 60, it is set as the pump troubleshooting mode by the pump troubleshooting mode setting section 30.
[0058] Thereby, a pump ****** control signal, a pump horsepower control signal, an engine-speed control signal, and a pump load-control signal are set as a predetermined value by the pump ****** control section 31, the pump horsepower control section 32, the engine-speed control section 33, and the pump load-control section 34, respectively. Moreover, if it becomes the pump troubleshooting mode, a pump discharge flow rate will be detected by the flow rate sensor 25, and the detection value of a flow rate sensor 25 will be recorded on the pump-performance Records Department 42. In addition, a pump discharge flow rate is measured by the flow rate sensor 25 at the time of shipment and an overhaul procedure, and the detection value of a flow rate sensor 25 is recorded on the pump-performance reference-value Records Department 41.
[0059] And counter value t as detection value QC of the flow rate sensor 25 recorded on the pump-performance Records Department 42, the detection value QS of the flow rate sensor 25 recorded on the pump-performance reference-value Records Department 41, and elapsed time from the time of the shipment from a counter 43 and an overhaul procedure is inputted into the degradation flow rate operation part 44, respectively. Subsequently, at the degradation flow rate operation part 44, they are the detection values QC and QS of these flow rate sensors 25. It is based on counter value t as elapsed time from the time of shipment and an overhaul procedure, and is degradation flow Q d. It is computed and is this degradation flow Q d. It is outputted to the gain operation part 45.
[0060] And degradation flow Q d computed by the degradation flow rate operation part 44 in the gain operation part 45 It is based, and on a map which is shown in drawing 5 , gain G is set up and this gain G is outputted to the fault-detect decision section 47. On the other hand, while the detection value of the metal-powder sensor 24 is inputted into the amount operation part 46 of detrimental metal powders, counter value t as elapsed time from the time of shipment and an overhaul procedure is inputted from a counter 43.
[0061] And the difference of the amount of metal powders usually generated by wear in the amount operation part 46 of detrimental metal powders, and the detection value of the metal-powder sensor 24 to amount calcium of detrimental metal powders It is computed and is this amount calcium of detrimental metal powders. It is outputted to the fault-detect decision section 47. Amount calcium of detrimental metal powders first inputted from the amount operation part 46 of detrimental metal powders in the fault-detect decision section 47 It rectifies by carrying out the multiplication of the gain G inputted from the gain operation part 45, and a correction detection value is computed.
[0062] Subsequently, it judges whether this correction detection value exceeded the threshold. As a result of this judgment, when the correction detection value is over the threshold, it judges with pump failure, and an alarm signal that the pump is out of order is outputted to display 26. Therefore, a correction detection value is computed by rectifying so that the detection value of the metal-powder sensor 24 may exceed a threshold in this operation gestalt, before a machine operator or a machine manager becomes the amount of predetermined wear metals which recognizes failure according to such a pump fault read-out unit. If a correction detection value exceeds a threshold, in order to judge with pump failure, the advantage that pump failure can be discovered is at an early stage rather than discovery of the pump failure by the operator or the machine manager.

[0063] Moreover, while the amount of metal powders is measured by the metal-powder sensor 24, a pump discharge flow rate is also measured by the flow rate sensor 25. In order to perform a pump failure judging using the correction detection value which rectified the detection value of the metal-powder sensor 24 according to the fall degree of the pump discharge flow rate measured by the flow rate sensor 25, Usually, an incorrect diagnosis of the failure resulting from a fall of the pump discharge flow rate by the incorrect diagnosis and aging of failure resulting from the metal powder generated by internal wear in an operating state can be prevented certainly, and there is an advantage that pump troubleshooting can be performed correctly and certainly.
[0064] Moreover, since the outflow flow rate of the pump 12 which considered as the troubleshooting mode, set the pump ****** control signal, the pump horsepower control signal, the engine-speed control signal, and the pump load-control signal as the predetermined value, and was always controlled by fixed conditions can be measured when performing pump troubleshooting, there is an advantage that pump troubleshooting can be performed correctly and certainly.
[0065] In addition, although it will judge with pump failure with the above-mentioned operation gestalt if the correction detection value on the basis of the detection value of the metal-powder sensor 24 exceeds a threshold, if the correction detection value on the basis of the detection value of a flow rate sensor 25 exceeds a threshold, you may be made to judge with pump failure. In this case, the failure judging means 23 calculates a correction detection value by rectifying the detection value of a flow rate sensor 25 gradually so that the detection value of a flow rate sensor 25 may exceed a threshold, before a machine operator or a machine manager becomes the predetermined defluxion flow rate which recognizes failure, and if this correction detection value exceeds a threshold, it constitutes it so that it may judge with pump failure. In addition, a predetermined defluxion flow rate means the pump defluxion flow rate which sees from the degradation of a pump 12 and may discover pump failure by the machine operator or the machine manager. Moreover, a threshold is set up as a value which permits the aging of the outflow flow rate to the exterior from a pump 12. Furthermore, a correction detection value is computed by rectifying the detection value of a flow rate sensor 25 based on the detection value of the metal-powder sensor 24. That is, a correction detection value rectifies the detection value from a flow rate sensor 25 by the correction factor which becomes large, and computes as the increase degree of the detection value from the metal-powder sensor 24 becomes large compared with the increase degree of the amount of wear metals by the aging.
[0066] Moreover, with the above-mentioned operation gestalt, although the flow rate sensor 25 is formed in the pump discharge duct, you may prepare in the pump drain path 20. In this case, since being detected by the flow rate sensor 25 became a drain flow rate (outflow flow rate from a pump 12), a setup of the degradation flow rate in the degradation flow rate operation part 44 and a setup of the gain in the gain setting section 45 should embrace the property of a drain flow rate. Moreover, although the hydraulic pump is used as the external-drain type hydraulic pump with the above-mentioned operation gestalt, you may be an internal-drain type hydraulic pump.
[0067] Moreover, although the above-mentioned operation gestalt explains the case where this pump fault read-out unit is applied to a hydraulic excavator, if an application of this invention is not restricted to this, and begins construction equipments, such as a

tractor, a loader, and a bulldozer, and it has a hydraulic pump at least, it is applicable similarly, and when it is any, it can acquire the same operation effect as ****.
[0068]
[Effect of the Invention] it explained in full detail above -- as -- claim 1- according to the pump fault read-out unit of this invention of 5, 8, and 9 publication, an incorrect diagnosis of the failure resulting from a fall of the pump discharge flow rate by the incorrect diagnosis and aging of failure resulting from the metal powder usually generated by internal wear in an operating state can be prevented certainly, and there is an advantage that pump troubleshooting can be performed correctly and certainly Moreover, there is an advantage that pump failure can be discovered early rather than an operator or a machine manager recognizes pump failure.
[0069] According to a claim 6 and the pump fault read-out unit of this invention of seven publications, since the outflow flow rate of a pump is always measurable on fixed conditions, there is an advantage that pump troubleshooting can be performed still correctly and certainly.

TECHNICAL FIELD

[The technical field to which invention belongs] Especially this invention is used for troubleshooting of the hydraulic pump with which a hydraulic excavator etc. is equipped about a pump fault read-out unit, and relates to a suitable pump fault read-out unit.

PRIOR ART

[Description of the Prior Art] Drawing 8 is a ** type view showing an example of the hydraulic excavator as a general construction equipment, and as shown in this drawing 8 , usually, the hydraulic excavator has offered the revolving super-structure 100 with operation room (cabin) 600 on the base carrier 500 which has infinite rail section 500A, and serves as the configuration of having equipped the joint formula arm device which becomes this revolving super-structure 100 from a boom 200, the stick 300, and the bucket 400 further.
[0003] And while this hydraulic excavator is equipped with the oil hydraulic cylinder 122 for the oil hydraulic cylinder 121 for the oil hydraulic cylinder 120 for a boom 200, and the stick 300, and the bucket 400 The hydraulic circuit for each of these oil hydraulic cylinders 120-122 (illustration abbreviation) is prepared at least. By carrying out electronics control of the flow rate of the hydraulic pump in this hydraulic circuit, or the control valve the oil hydraulic cylinder 120 - for 122 according to operation (operation of the control lever in a cabin 600) of an operator, and changing suitably the amount of supply (oil pressure) of the hydraulic oil to oil hydraulic cylinders 120-122 expansion and contraction of oil hydraulic cylinders 120-122 -- a variation rate -- an amount changes and a boom 200, the stick 300, and the bucket 400 drive, respectively

EFFECT OF THE INVENTION

[Effect of the Invention] it explained in full detail above -- as -- claim 1- according to the pump fault read-out unit of this invention of 5, 8, and 9 publication, an incorrect diagnosis of the failure resulting from a fall of the pump discharge flow rate by the incorrect diagnosis and aging of failure resulting from the metal powder usually generated by internal wear in an operating state can be prevented certainly, and there is an advantage that pump troubleshooting can be performed correctly and certainly Moreover, there is an advantage that pump failure can be discovered early rather than an operator or a machine manager recognizes pump failure.

[0069] According to a claim 6 and the pump fault read-out unit of this invention of seven publications, since the outflow flow rate of a pump is always measurable on fixed conditions, there is an advantage that pump troubleshooting can be performed still correctly and certainly.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, since such a construction equipment begins a job site, a calamity restoration site, etc. and is usually used in many cases in the very severe status, it needs to perform the suitable treatment to the abnormalities and failure. Although [most important] especially a hydraulic pump serves as the source of power of such a construction equipment, when the interior of a hydraulic pump is damaged, or a crack arises inside and the hydraulic pump itself breaks down, **** time generates it in ****** of a construction equipment. By foreknowing this pump failure beforehand, to make such **** time into the minimum is desired.

[0005] Then, in such a construction equipment, troubleshooting of a hydraulic pump is performed and various things are proposed as such pump troubleshooting. For example, since failure of a hydraulic pump can be indirectly judged by seeing the flow rate which flows a drain circuit, the technique of performing troubleshooting of a hydraulic pump based on this is indicated by JP,7-280688,A. That is, the flow rate sensor which emits the signal showing the drain flow rate of a pump is prepared, and when either of the rate of change of a drain flow rate or a flow rate exceeds a constant, the technique diagnosed as pump failure is indicated.

[0006] However, since such pump troubleshooting is what diagnoses failure of a hydraulic pump indirectly through a drain flow rate etc., it cannot necessarily perform troubleshooting correctly and certainly. For example, if the interior of a hydraulic pump is damaged, a comparatively big metal chip precipitates in a hydraulic oil or a crack arises inside a hydraulic pump, since a big change will produce a drain circuit to the flowing flow rate, By setup of a threshold [in / though this drain flow rate can perform troubleshooting / pump troubleshooting], when a metal powder is accumulated and the degradation by the aging is usually produced by internal wear in an operating state, it may diagnose as pump failure.

[0007] Moreover, the technique of performing troubleshooting of a pump based on the detection information from the amount detection sensor of metal powders is indicated by

JP,6-11376,A. That is, in such pump troubleshooting, as shown in drawing 9 , the metal-powder sensor (a chip detector, metal sensor) 24 is formed in the pump drain line 20 (or pump-case housing), and if the amount of metal powders of the amount set up beforehand is detected by the metal-powder sensor 24, the technique of diagnosing the purport whose pump 12 is failure is indicated. In addition, the sign 11 shows the tank among drawing 9 .
[0008] However, in such pump troubleshooting, by setup of the threshold in pump troubleshooting, when a metal powder is usually accumulated by internal wear in an operating state, it may diagnose as pump failure. Then, if the threshold for avoiding above un-arranging is greatly set as pump troubleshooting, though a pump 12 will break down and the output value of the metal-powder sensor 24 will become large, in order not to immediately exceed a threshold, discovering of pump failure becomes behind.
[0009] For example, as shown in drawing 10 , when the threshold in pump troubleshooting is set up greatly, it is t3 that pump failure is discovered with the detection value of the metal-powder sensor 24. t2 by which a time comes and pump failure is discovered by a machine operator or the machine manager It will become later than a time. Now, pump failure will be known until an operator or a machine manager notices a construction equipment at the bad condition of a machine, and it is inconvenient.
[0010] In addition, solid-line A shows the output-value property of the metal-powder sensor 24, and the amount property of metal powders of usually generating dashed-line B by internal wear in an operating state, among drawing 10 . And the difference with the amount of metal powders generated by internal wear of usually in an operating state with the output value of this metal-powder sensor 24 is the amount of metal powders produced when pump failure has arisen, and expresses this as the amount of detrimental metal powders intelligibly. Moreover, the inside of drawing 10 and t1 The crash start time is shown at the time.
[0011] It was originated in view of such a technical probrem, and this invention prevents an incorrect diagnosis of pump failure certainly, and aims at offering the pump fault read-out unit which enabled it to perform pump troubleshooting correctly and certainly.

MEANS

[Means for Solving the Problem] For this reason, the pump fault read-out unit of this invention according to claim 1 The metal sensor which detects the amount of wear metals of a pump, and the flow rate sensor which detects the flow rate of this pump, A correction detection value calculation means to calculate the correction detection value which seasoned the detection value of one sensor of a threshold setting means to set up the threshold for a pump failure judging, and these metal sensors and these flow rate sensors with the correction value which makes the detection value of the sensor of another side a parameter, It is characterized by having compared with this threshold from this threshold setting means this correction detection value acquired with this correction detection value calculation means, offering a judgment means to judge whether this pump is failure, and being constituted based on this comparison result.
[0013] In equipment according to claim 1, as for the pump fault read-out unit of this invention according to claim 2, this threshold setting means is characterized by having set up a threshold which permits the aging of the amount of wear metals of this pump, or the

flow rate of this pump. The pump fault read-out unit of this invention according to claim 3 Before becoming the amount of wear metals or flow rate a machine operator or a machine manager recognizes failure to be in equipment according to claim 1 or 2 It is characterized by constituting this correction detection value calculation means so that this pump may set up this correction value of the value which may output the judgment result of the purport which is failure, this judgment means may season the detection value of one above-mentioned sensor with this correction value and this correction detection value may be calculated.

[0014] In equipment given in any 1 term of the claim 1 or the claim 3, as for the pump fault read-out unit of this invention according to claim 4, this correction detection value acquired with this correction detection value calculation means is characterized by rectifying the detection value from this metal sensor, and being computed based on the detection value from this flow rate sensor. It is characterized by constituting the pump fault read-out unit of this invention according to claim 5 so that this correction detection value calculation means may rectify the detection value from this metal sensor by the correction factor which becomes large as the fall degree of the flow rate of this pump becomes large compared with the fall degree of the flow rate of this pump by the aging and may compute this correction detection value in equipment according to claim 4.

[0015] The pump fault read-out unit of this invention according to claim 6 is characterized by establishing the pump-control means which can control this pump in the troubleshooting mode status which fixed the pump-output change element at the time of the pump failure judging by this judgment means in equipment according to claim 1. The pump fault read-out unit of this invention according to claim 7 is characterized by constituting this pump-control means in equipment according to claim 6, so that this pump can be controlled in this troubleshooting mode status by setting a pump ****** control signal, a pump horsepower control signal, an engine-speed control signal, and a pump load-control signal as a predetermined value.

[0016] It is characterized by connecting the regurgitation path and the drain path to this pump, building this flow rate sensor in this pump, or arranging it in this regurgitation path in equipment according to claim 1, while this metal sensor is built in this pump or is formed in this drain path, or arranging the pump fault read-out unit of this invention according to claim 8 in this drain path.

[0017] The pump fault read-out unit of this invention according to claim 9 is characterized by this flow rate sensor being a reaction formula flow rate sensor in equipment according to claim 1 or 8.

[0018]

[Embodiments of the Invention] Hereafter, a drawing explains the gestalt of operation of this invention. Drawing 2 is drawing showing the hydraulic excavator as such a work machine in the 1 operation gestalt of this invention typically, and as shown in this drawing 2 , such a hydraulic excavator has become right and left to the advance orientation at this operation gestalt with the configuration that the revolving super-structure with the operation room 600 100 (construction-equipment mainframe) was formed free [rotation] in the level surface on the base carrier 500 which has infinite rail section 500A.

[0019] And the boom (boom member) 200 to which an end is connected possible [rotation] is established to this revolving super-structure 100, and the stick (arm member)

300 to which an end is connected possible [rotation] through the joint section is further formed to the boom 200. Furthermore, to a stick 300, an end is connected possible [rotation] through the joint section, a nose of cam excavates the ground, and the bucket (workplace material) 400 which can hold earth and sand is formed in the interior.
[0020] Moreover, as shown in this drawing 2 , the boom oil hydraulic cylinder 120, the stick oil hydraulic cylinder 121, and the bucket oil hydraulic cylinder 122 (hereafter, there is only the boom cylinder 120 or a cylinder 120 about the boom oil hydraulic cylinder 120, there is only a stick cylinder 121 or a cylinder 121 about the stick oil hydraulic cylinder 121, and there is only the bucket hydraulic cylinder 122 or a cylinder 122 about the bucket oil hydraulic cylinder 122) are formed in this hydraulic excavator to the above-mentioned boom 200, the stick 300, and the bucket 400.
[0021] Here, when the distance between edges expands and contracts, it connects possible [rotation of other ends] to a boom 200, namely, a boom cylinder 120 is infixed between a revolving super-structure 100 and the boom 200, and it can rotate a boom 200 to a revolving super-structure 100, while an end is connected possible [rotation] to a revolving super-structure 100.
[0022] Moreover, it connects possible [rotation of other ends] to a stick 300, namely, the stick cylinder 121 is infixed between a boom 200 and the stick 300 while an end is connected possible [rotation] to a boom 200, and when the distance between edges expands and contracts, it can rotate a stick 300 to a boom 200.
[0023] Furthermore, while a bucket hydraulic cylinder 122 is connected possible [rotation of an end] to a stick 300, it connects possible [rotation of other ends] to a bucket 400, namely, is infixed between a stick 300 and the bucket 400, and when the distance between edges expands and contracts, a bucket 400 can be rotated to a stick 300. In addition, the link mechanism 130 is formed in the point of the bucket oil hydraulic cylinder 122.
[0024] Moreover, although not illustrated, the hydraulic motor which drives infinite rail section 500A on either side, respectively, and the revolution motor which carries out the revolution drive of the revolving super-structure 100 are also formed. And as shown in drawing 1 and the drawing 2 , respectively, at least, the hydraulic circuit 2 for cylinders 120-122 or the above-mentioned revolution motor 123 is formed, and as shown in drawing 1 , the hydraulic oil tank 11, the hydraulic pump 12 driven by engine (diesel power plant) E, the control valve (the method change valve of three, directional control valve) 13, etc. are further infixed in this hydraulic circuit 2 at the above-mentioned hydraulic excavator. In addition, the hydraulic circuit 2 shows only the thing required for an explanation among drawing 1 .
[0025] Here, a hydraulic oil tank 11 ****s a hydraulic oil. A hydraulic pump 12 carries out regurgitation supply of the hydraulic oil in this hydraulic oil tank 11 as a predetermined pressure oil, it is constituted as a piston type variable-capacity pump here, and the control of flow of a hydraulic oil is possible by changing the amount of strokes of the piston (illustration abbreviation) prepared in the pump 12. That is, the end of the above-mentioned piston is constituted so that a cam plate (creep plate:illustration abbreviation) may be contacted, the amount of strokes of a piston is changed by changing the inclination (******) of this cam plate by control-of-flow section 12a, and the flow rate of a pump 12 is changed.
[0026] A control valve 13 is for changing the supply orientation of the hydraulic oil to a

cylinder 120, and controlling expansion and contraction of a cylinder 120. moreover, here If it changes to an opposite direction while a hydraulic oil is supplied to a room in one, a hydraulic oil will be extracted from a room among another side and a cylinder 120 will be extended if it changes from a center valve position to ** on the other hand, respectively While a hydraulic oil is supplied to a room among another side, a hydraulic oil is extracted from a room in one, and a cylinder 120 is shrunken.

[0027] Moreover, although not illustrated in drawing 1 , the control valve for changing the supply orientation of the hydraulic oil to a cylinder 121,122, and controlling expansion and contraction of a cylinder 121,122 is also prepared independently, and it operates similarly about these control valves. Moreover, although not illustrated in drawing 1 , the control valve for changing the supply orientation of the hydraulic oil to a revolution motor, and controlling a revolution motor rotation direction is also prepared independently, and a revolution motor rotation direction reverses it according to a change of the orientation of this control valve.

[0028] Although each change control of each of these control valves is performed by the control means 22 of a controller 1 established in the revolving super-structure 100, with this control means 22, based on the operation information acquired when an operator operates the boom / bucket control lever 6 in the operation room 600, and the stick / revolution control lever 8, the change control signal for a control valve is generated, and a change control signal is supplied to each control valve, respectively.

[0029] Here, a control signal sends to the pilot secondary-pressure-of-reducing-valve control section 35 from the pump load-control section 34 of the control means 22. Moreover, the pump drain line (drain path) 20 is connected outside from the drain port (not shown), and the oil in a hydraulic pump 12 carries out a drain to a hydraulic pump 12 to a hydraulic oil tank 11 through this pump drain line 20. In addition, that by which the pump drain line 20 is connected in this way to the exterior of a hydraulic pump 12 is called external-drain type hydraulic pump.

[0030] By the way, in the above-mentioned hydraulic pump 12, internal friction will arise into the movable fraction, and internal wear will arise by this. For this reason, if the interior is worn to some extent out, it is necessary to exchange for a new thing. This exchange stage can be judged by seeing the amount of wear metals which has precipitated inside a hydraulic pump 12. This is because there is an inclination which the amount of wear metals which precipitates inside a hydraulic pump 12 increases, when the interior of a hydraulic pump 12 is worn out.

[0031] On the other hand, the interior of a hydraulic pump 12 other than precipitation of the metal powder by such internal wear may be damaged, a crack may arise inside the case where a comparatively big metal chip mixes into a hydraulic oil, or the hydraulic pump 12, and an internal leak may arise. Then, with this operation gestalt, internal wear of a hydraulic pump 12, an internal leak, etc. are detected, troubleshooting of a hydraulic pump 12 is performed based on these, and that an alarm signal should be outputted, as shown in drawing 1 , the pump fault read-out unit 10 is formed in the above-mentioned hydraulic circuit 2.

[0032] The metal-powder sensor (a metal sensor, chip detector) 24, the flow rate sensor 25, and the controller 1 are offered, and the pump fault read-out unit 10 is constituted, as shown in drawing 1 . Here, as shown in drawing 3 , the metal-powder sensor 24 is formed in the pump drain line 20, detects the amount of wear metals which has precipitated

inside a hydraulic pump 12, and detects internal wear of a hydraulic pump 12 with this amount of wear metals. In addition, you may make the metal-powder sensor 24 build in in a housing case.

[0033] Moreover, the detection value of the metal-powder sensor 24 is detected as a value proportional to a voltage, and the detection value from this metal-powder sensor 24 is continuously monitored by the controller mentioned later. A flow rate sensor 25 is a low voltage disadvantage type reaction formula flow rate sensor, as shown in drawing 3 . Such a reaction formula flow rate sensor is used because it may have a bad influence of the grade in which remarkable back pressure arises and the amount of discharge flows from a pump 12 is reduced in the flow rate sensor used from the former like a turbine flow rate sensor.

[0034] The force which inserts resistor 25a into flowing of a hydraulic oil, and is received from flowing of a hydraulic oil is measured using the force of receiving a flow rate sensor 25 from flowing of a hydraulic oil being proportional to the square of the rate of flow, and a pump discharge flow rate (outflow flow rate from a pump) is detected based on this. This flow rate sensor 25 has short rectification length, and is an accurate sensor.

[0035] A flow rate sensor 25 is arranged in the regurgitation path 21 connected to a hydraulic pump 12, and detects the amount of discharge flows of a hydraulic pump 12. In addition, since the flow rate sensor 25 is compact, it can be made to be able to build in a pump 12, or can also be arranged in a pump discharge port (not shown). And in order to take the degradation by the aging into consideration in pump troubleshooting with this operation gestalt, it is pump discharge flow Q S by the flow rate sensor 25 in the troubleshooting mode of a **** [time / of shipment and an overhaul procedure]. Instrumentation carries out. In addition, pump discharge flow Q S which does in this way and was measured It records on the pump-performance reference-value Records Department 41 which mentions later.

[0036] Moreover, during an operation of a construction equipment, if the information urged to measuring a pump discharge flow rate periodically is displayed on display 26, an operator operates the mode selection equipment 60 according to this and it is set as the troubleshooting mode, it is pump discharge flow Q C by the flow rate sensor 25. It measures. In addition, pump discharge flow Q C which does in this way and was measured It records on the pump-performance Records Department 42 which mentions later.

[0037] In addition, although urged to measuring a pump discharge flow rate periodically, whenever a metal powder is detected by the metal-powder sensor 24, you may be made to urge to measuring a pump discharge flow rate here. A controller 1 is a control means, in order to perform pump troubleshooting, as shown in drawing 1 .

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing a whole such pump fault read-out unit configuration in the 1 operation gestalt of this invention.

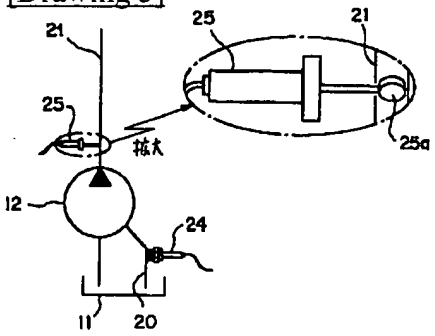
[Drawing 2] It is the ** type view showing the hydraulic excavator which equips the 1 operation gestalt of this invention with such a pump fault read-out unit.

[Drawing 3] It is the ** type view showing the metal-powder sensor and flow rate sensor of such a pump fault read-out unit in the 1 operation gestalt of this invention.
[Drawing 4] It is drawing for explaining the degradation flow rate operation part of such a pump fault read-out unit to the 1 operation gestalt of this invention.
[Drawing 5] It is drawing for explaining the gain operation part of such a pump fault read-out unit to the 1 operation gestalt of this invention.
[Drawing 6] It is drawing for explaining the amount operation part of detrimental metal powders of such a pump fault read-out unit to the 1 operation gestalt of this invention.
[Drawing 7] It is drawing for explaining the failure judging means of such a pump fault read-out unit to the 1 operation gestalt of this invention.
[Drawing 8] It is the ** type view showing an example of the hydraulic excavator as a common work machine.
[Drawing 9] It is the ** type view showing the metal-powder sensor of the conventional pump fault read-out unit.
[Drawing 10] It is drawing for explaining the failure judging in the conventional pump fault read-out unit.
[Description of Notations]
1 Controller
2 Hydraulic Circuit
10 Fault Read-out Unit
11 Hydraulic Oil Tank
12 Hydraulic Pump
12a Control-of-flow section
13 Control Valve (Method Change Valve of Three, Directional Control Valve)
20 Pump Drain Line (Drain Path)
21 Regurgitation Path
22 Control Means
23 Failure Judging Means
24 Metal-Powder Sensor (Chip Detector, Metal Sensor)
25 Flow Rate Sensor
26 Display (Display Means)
31 Pump ****** Control Section
32 Pump Horsepower Control Section
33 Engine-Speed Control Section
34 Pump Load-Control Section
35 Pilot Secondary-Pressure-of-Reducing-Valve Control Section
41 Pump-Performance Reference-Value Records Department
42 Pump-Performance Records Department
43 Counter
44 Degradation Flow Rate Operation Part
45 Gain Operation Part
46 The Amount Operation Part of Detrimental Metal Powders
47 Fault-Detect Decision Section
51 Pump Design-Basis Value Records Department
52 Shipment Performance Decision Section

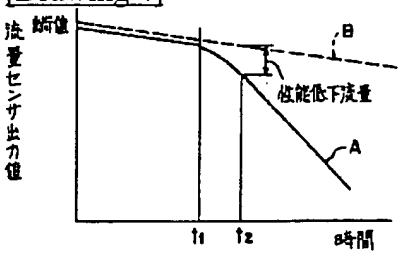
60 Mode Selection Equipment
E Engine (diesel power plant)

DRAWINGS

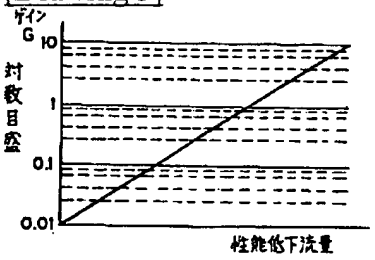
[Drawing 3]



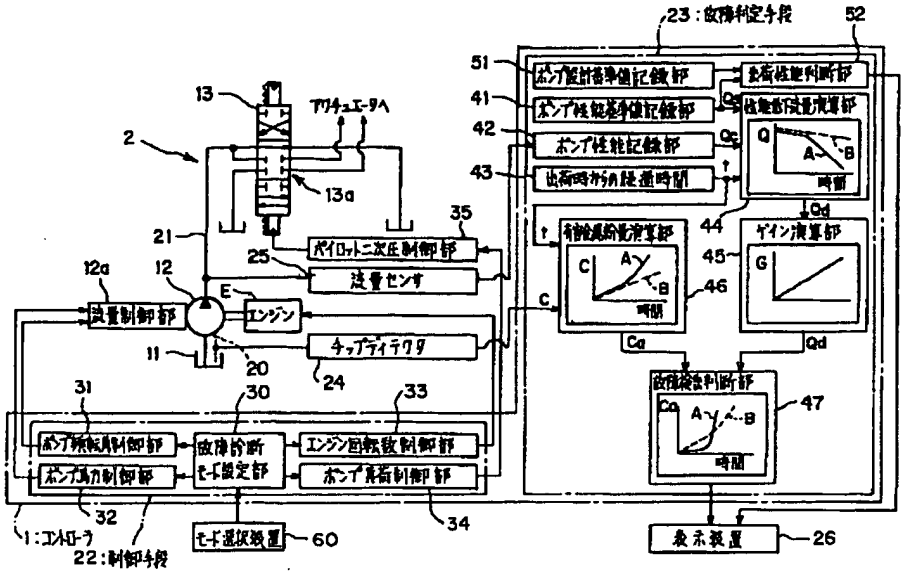
[Drawing 4]



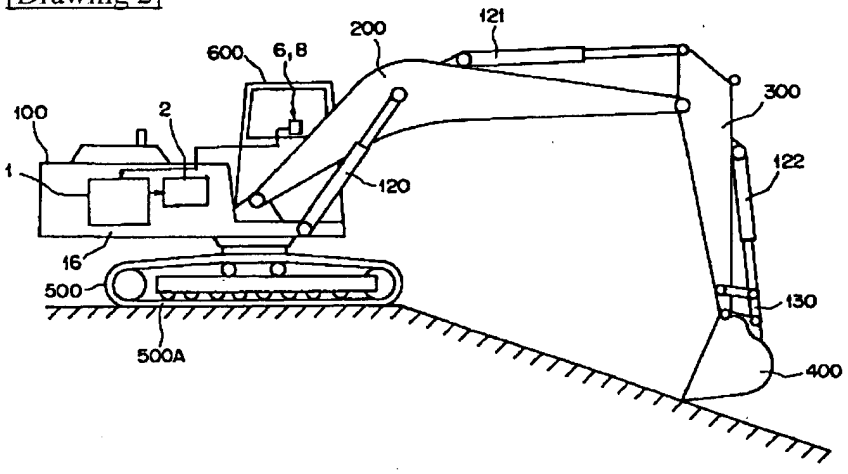
[Drawing 5]



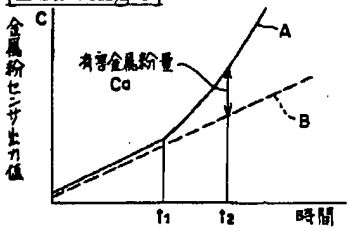
[Drawing 1]



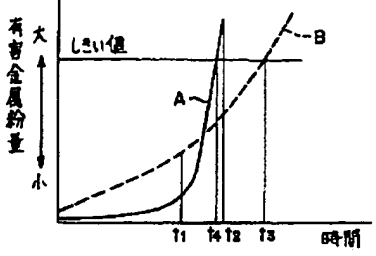
[Drawing 2]



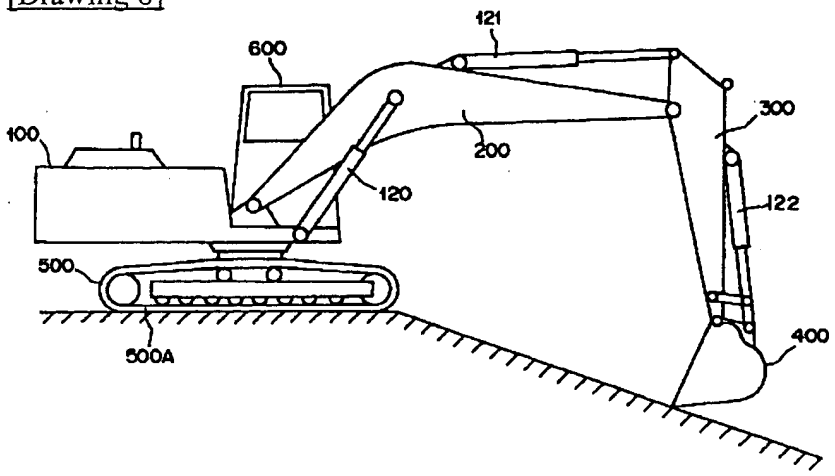
[Drawing 6]



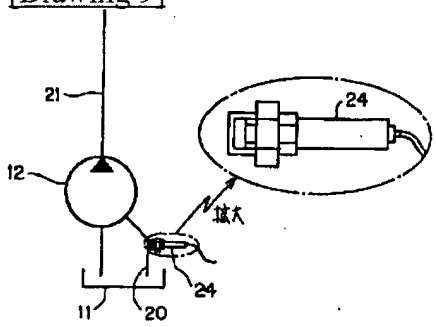
[Drawing 7]



[Drawing 8]



[Drawing 9]



[Drawing 10]